

## ESDxx2X-15D(I)

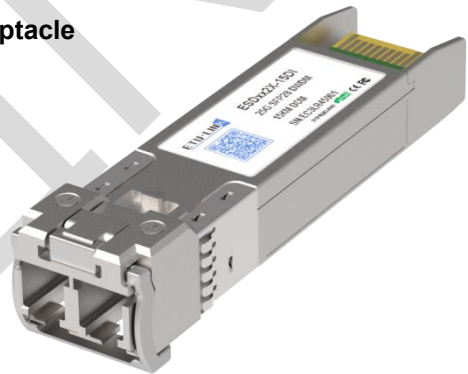
### 25Gb/s SFP28 DWDM 15km DDM Transceiver

#### PRODUCT FEATURES

- Supports up to 25.78Gbps bit rates
- Hot-pluggable SFP+ footprint
- 100GHz ITU, C Band DWDM Cooled EML laser and APD photodiode,
- Up to 15km for SMF transmission
- Compliant with SFP+ MSA and SFF-8472 with duplex LC receptacle
- Compatible with RoHS
- Single +3.3V power supply
- Power dissipation <2W
- Real Time Digital Diagnostic Monitoring
- Operating case temperature:

Commercial: 0°C ~70°C

Industrial: -40°C ~85°C



#### APPLICATIONS

- 25G Ethernet
- CPRI 10

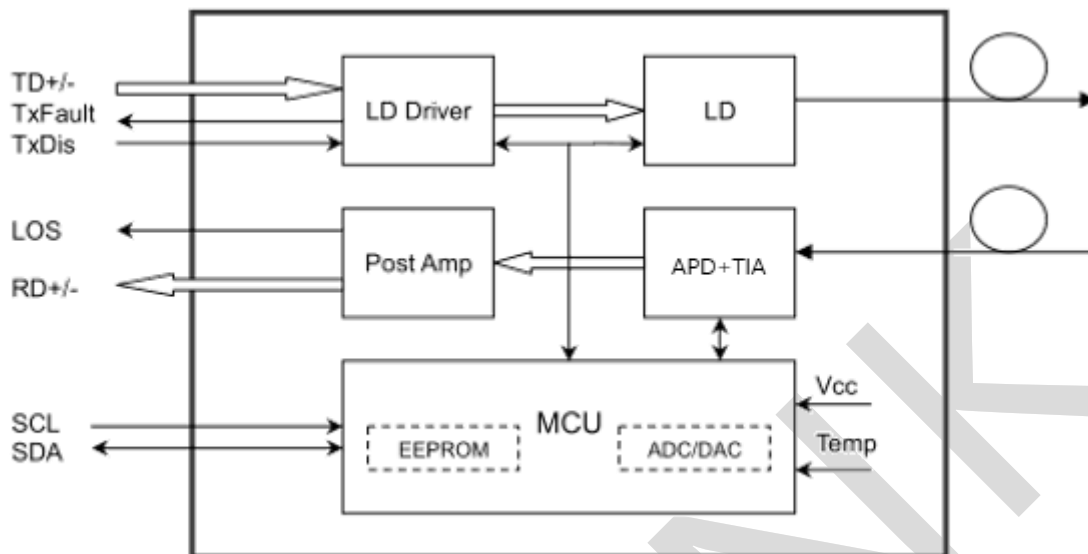
#### DESCRIPTIONS

The SFP28 transceivers are high performance, cost effective modules supporting data rate of 25.78Gbps and 15km transmission distance with SMF.

The transceiver consists of three sections: a Cooled EML laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement and SFF-8472 digital diagnostics functions.

## Module Block Diagram



## Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI	Latch Color
ESDxx2X-15D	25.78125Gb/s	EML	SM	15km	LC	0°C~+70°C	Y	Red
ESDxx2X-15DI	25.78125Gb/s	EML	SM	15km	LC	-40°C~+85°C	Y	Red

## Wavelength Guide Table

Channel	Wavelength (nm)	Frequency(THZ)	Channel	Wavelength (nm)	Frequency(THZ)
C12	1567.95	191.20	C42	1543.73	194.20
C13	1567.13	191.30	C43	1542.94	194.30
C14	1566.31	191.40	C44	1542.14	194.40
C15	1565.50	191.50	C45	1541.35	194.50
C16	1564.68	191.60	C46	1540.56	194.60
C17	1563.86	191.70	C47	1539.77	194.70
C18	1563.05	191.80	C48	1538.98	194.80
C19	1562.23	191.90	C49	1538.19	194.90
C20	1561.42	192.00	C50	1537.40	195.00
C21	1560.61	192.10	C51	1536.61	195.10
C22	1559.79	192.20	C52	1535.82	195.20

C23	1558.98	192.30	C53	1535.04	195.30
C24	1558.17	192.40	C54	1534.25	195.40
C25	1557.36	192.50	C55	1533.47	195.50
C26	1556.55	192.60	C56	1532.68	195.60
C27	1555.75	192.70	C57	1531.90	195.70
C28	1554.94	192.80	C58	1531.12	195.80
C29	1554.13	192.90	C59	1530.33	195.90
C30	1553.33	193.00	C60	1529.55	196.00
C31	1552.52	193.10	C61	1528.77	196.10
C32	1551.72	193.20	C62	1527.99	196.20
C33	1550.92	193.30	C63	1527.22	196.30
C34	1550.12	193.40	C64	1526.44	196.40
C35	1549.32	193.50	C65	1525.66	196.50
C36	1548.51	193.60	C66	1524.89	196.60
C37	1547.72	193.70	C67	1524.11	196.70
C38	1546.92	193.80	C68	1523.34	196.80
C39	1546.12	193.90	C69	1522.56	196.90
C40	1545.32	194.00	C70	1521.79	197.00
C41	1544.53	194.10			

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Supply Voltage	V <sub>cc</sub>	-0.5		4.5	V	
Storage Temperature	T <sub>s</sub>	-40		+85	°C	
Operating Humidity	-	5		85	%	

## Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Case Operating Temperature	T <sub>op</sub>	0	-	70	°C	Commercial
		-40		85		Industrial
Power Supply Voltage	V <sub>cc</sub>	3.135	3.30	3.465	V	
Power Supply Current	I <sub>cc</sub>			700	mA	
Data Rate			25.78		Gbps	

## Electrical Characteristics

High-Speed Signal: Compliant to CEI-25G-VSR

Low-Speed Signal: Compliant to SFF-8419

Parameter		Symbol	Min.	Typical	Max.	Unit	Notes
<b>Transmitter (Module Input)</b>							
Differential Input Resistance		R_R <sub>din</sub>	90	100	110	Ω	
Input Differential Voltage		R_V <sub>diff</sub>	-	-	900	mVpp	
Tx_Disable	Normal Operation	V <sub>IL</sub>	-0.3	-	0.8	V	
	Laser Disable	V <sub>IH</sub>	2.0	-	V <sub>CC</sub> +0.3	V	
<b>Receiver (Module Output)</b>							
Differential Resistance		T_R <sub>d</sub>	90	100	110	Ohm	
Output Differential Voltage		T_V <sub>diff</sub>	-	-	900	mVpp	
Differential Termination Resistance Mismatch		T_R <sub>dm</sub>	-	-	10	%	
Rx los	Normal Operation	V <sub>OL</sub>	-0.3	-	0.4	V	
	Loss Signal	V <sub>OH</sub>	2	-	V <sub>CC</sub> H <sub>OST</sub>	V	

## Optical and Characteristics

Parameter		Symbol	Min.	Typical	Max.	Unit	Notes	
<b>Transmitter</b>								
Average Output Power		POUT	0		5	dBm	1	
Average Output Power(Laser Off)		POFF			-30	dBm		
Wavelength		λ	λ <sub>c</sub> -0.1	λ <sub>c</sub>	λ <sub>c</sub> +0.1	nm		
Spectrum Bandwidth @ -20dB		Δλ			1	nm		
Side mode suppression ratio(SMSR)		SMSR	30			dB		
Extinction ratio		ER	4			dB		
Transmitter waveform and dispersion penalty (TWDP)					4.7	dB		
Optical Eye Mask			IEEE 802.3 cc					2
RIN <sub>20</sub> OMA		RIN			-130	dB/Hz		
<b>Receiver</b>								
Wavelength		λ	1260		1620	nm		
Received Sensitivity		P <sub>IN</sub>			-19	dBm	3	
Optical Power Overload		P <sub>IN</sub> (SAT)	-5			dBm		
Rx_LOS of Signal Assert		P <sub>A</sub>	-30			dBm		
Rx_LOS of Signal De-assert		P <sub>D</sub>			-20	dBm		
Rx_LOS of Signal Hysteresis		PH <sub>y</sub>	0.5		5	dB		

Notes:

1. The optical power is launched into SMF.

2. Mask margin BER  $\leq 5E-5$

3. Measured with a PRBS 231-1 test pattern @25.78Gbps, BER  $\leq 5E-5$ .

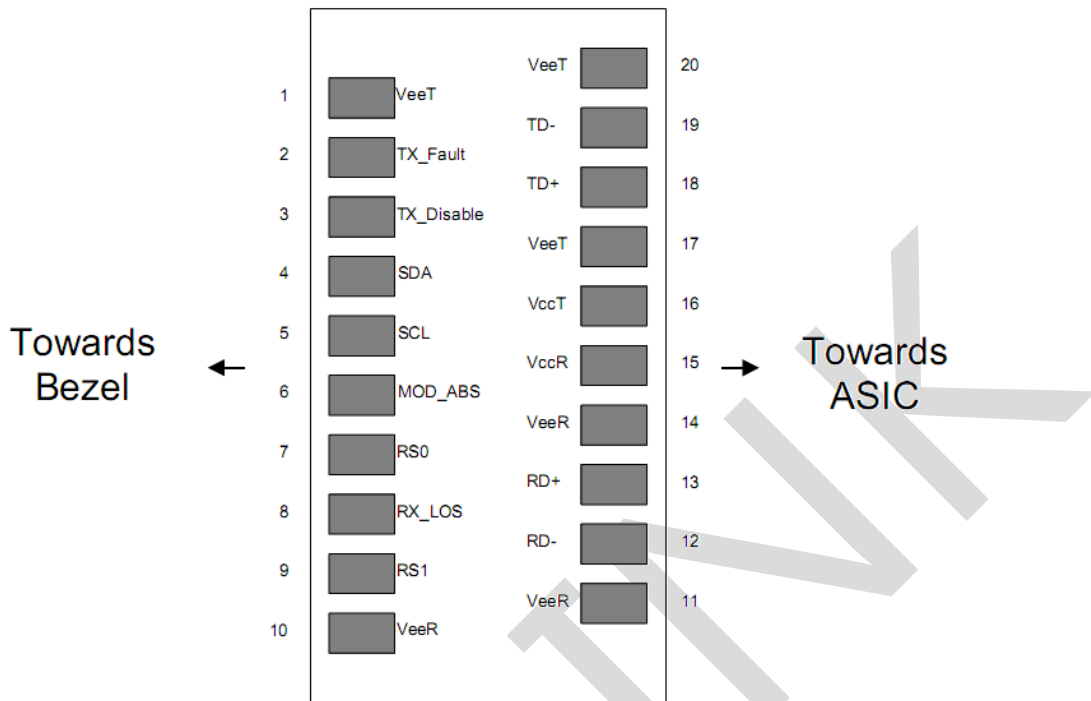
## Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	$\pm 3^{\circ}\text{C}$	$^{\circ}\text{C}$	Internal
Voltage	3 to 3.6	$\pm 3\%$	V	Internal
Bias Current	0 to 120	$\pm 10\%$	mA	Internal
TX Power	0 to 5	$\pm 3\text{dB}$	dBm	Internal
RX Power	-20 to -5	$\pm 3\text{dB}$	dBm	Internal

## Communication Interface Timing Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Tx Disable Negate Time	t_on			1	ms	
Tx Disable Assert Time	t_off			10	$\mu\text{s}$	
Time To Initialize, including Reset of Tx Fault	t_init			300	ms	
Tx Fault Assert Time	t_fault			100	$\mu\text{s}$	
Tx Disable To Reset	t_reset	10			$\mu\text{s}$	
LOS Assert Time	t_loss_on			100	$\mu\text{s}$	
LOS De-assert Time	t_loss_off			100	$\mu\text{s}$	
Serial ID Clock Rate	f_serial_clock		100	400	KHz	
MOD_DEF (0:2)-High	V <sub>H</sub>	2		V <sub>cc</sub>	V	
MOD_DEF (0:2)-Low	V <sub>L</sub>			0.8	V	

## Pin Diagram



## Pin Definitions

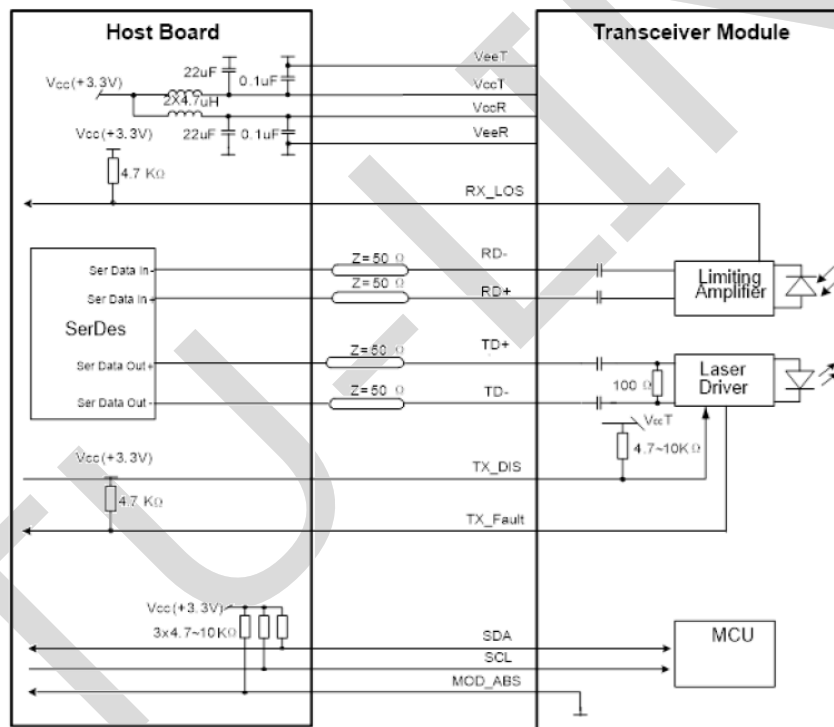
PIN #	Name	Function	Notes
1	VEET	Transmitter Ground	
2	TX FAULT	Transmitter Fault Indication	Note 1
3	TX DISABLE	Transmitter Disable	Note 2
4	SDA	SDA Serial Data Signal	
5	SCL	SCL Serial Clock Signal	
6	MOD_ABS	Module Absent. Grounded within the module	
7	RS0	Not Connected	
8	LOS	Loss of Signal	Note 3
9	RS1	Not Connected	
10	VEER	Receiver ground	
11	VEER	Receiver ground	
12	RD-	Inv. Received Data Out	Note 4
13	RD+	Received Data Out	Note 4
14	VEER	Receiver ground	
15	VCCR	Receiver Power Supply	
16	VcCT	Transmitter Power Supply	
17	VEET	Transmitter Ground	
18	TD+	Transmit Data In	Note 5
19	TD-	Inv. Transmit Data In	Note 5

20	V <sub>EET</sub>	Transmitter Ground	
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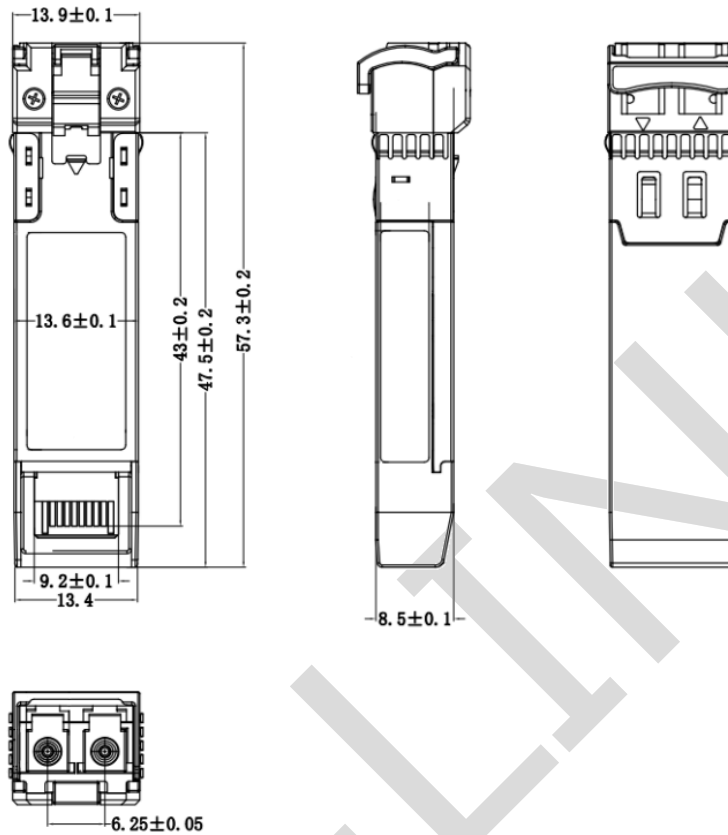
Notes:

1. TX Fault is an open collector output, which should be pulled up with a 4.7k $\Omega$  resistor on the host board to a voltage between 2.0V and V<sub>cc</sub>+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. LOS is open collector output. Should be pulled up with 4.7k $\Omega$  on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
4. RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100 $\Omega$  (differential) at the user SERDES.
5. TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100 $\Omega$  differential termination inside the module.

Recommended Interface Circuit



## Mechanical Diagram



## Revision History

Version No.	Date	Description
1.0	May 11 2019	Preliminary datasheet
2.0	Dec 15 2023	Product upgrades
2.1	Aug 20, 2024	Format change

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